Guest Editorial

Negative Evidence: Musculoskeletal Manifestations and the Safety Profile of COVID-19 mRNA Vaccines

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Introduction

This article belongs to an editorial series examining controversial issues at the intersection of medicine, science, and politics.[1-18] It aims to critically evaluate both official **narratives** and prominent dissenting perspectives within these disputes. The views expressed herein reflect the author's **opinions**, formulated using a dual approach to appraise the information available at the time of writing. A **conventional synthesis** of peer-reviewed scientific literature and informal dissenting publications is ***augmented*** by the application of the **negative evidence** method.[1,19] This analytical technique identifies **clearly unexpected**, significant information gaps within the available official and unofficial corpora of publications. By investigating the absence of anticipated data, an objective analyst can infer whether pertinent facts are being deliberately withheld. Because the scientific research and dissenting discourse are continuing, the opinions regarding any subject within this series remain subject to revision as novel information emerges.

This installment of the series examines the underappreciated musculoskeletal adverse effects of mRNA COVID-19 vaccines. The relevance of this topic extends well beyond the scope of clinical medicine by illustrating a widening chasm between academia and the public. This disturbing divide keeps expanding to the detriment of our nation. Yet, it remains misunderstood, and many solutions implemented by the Republican Administration have caused additional societal harm instead of improvements.[20,21]

A comprehensive analysis of this crisis in institutional trust and a suggested remedy were recently detailed in the paper "American Academia at Cross-Roads: Left or Right Supremacy? Power Balance or Death by Demolition?"[21] The core concepts relevant to the heated dispute over musculoskeletal side effects of mRNA vaccine are summarized below. Readers are encouraged to consult the original publication for details because of the general importance of the crisis of the American academy. That analysis observes that despite scientific breakthroughs, public discourse remains mired in acrimonious, recurring disputes over purely empirical questions: mRNA vaccine safety, SARS-CoV-2 origins, anthropogenic climate change, chemtrails, and similar issues. Modern science should resolve these quandaries promptly and decisively—yet they persist. The paradox is caused by three interconnected drivers: extreme political polarization of society, severe politicization of science, and the resulting collapse of public trust in traditional academic expertise.

American academia has long been celebrated as a powerhouse of innovation, prosperity, advanced medicine, and military strength. Yet, right-leaning Americans increasingly dismiss these enduring achievements, viewing universities as hostile bastions of leftist ideology and Woke indoctrination. This perception, intensified by academicians' atrocious behavior during the COVID-19 pandemic, has produced deep distrust towards academia. Many on the Right now see academic institutions not as neutral arbiters of truth, but as enablers of left-wing tyranny.

Such distrust is well deserved. U.S. colleges were born from conservative, religious European roots and retained a strong right-leaning character for most of their history. American colleges became more politically neutral and secular only after the adoption of the "enlightened" Humboldtian model at the end of the nineteenth century. However, they still remained faithful to the classic conservative traditions. They shifted into extreme Left only after the 1960s cultural upheavals of the Civil Rights Movement and Vietnam, which turned campuses into bustling centers of left-wing activism. Regrettably, this slow but pervasive takeover faced no resistance from the Right. Right-wing public and politicians kept ignoring the sinister takeover of American academe by the darkest type of Leftism. They did not understand either the objective value of academia or the immense power that academic experts can exert during disasters such as a pandemic.

This oversight had understandable roots. Paradoxically, the economic prosperity generated by the innovations developed by academicians enabled many on the Right to achieve financial success without obtaining academic degrees. Small-business owners and employees—the core right-wing demographic—often earned more than most academics. Those personal circumstances blinded them to the fact that the exceptional advantages that America enjoyed stemmed largely from the contributions of both old right-wing and even new left-wing academia. Unable to recognize those facts from their vantage point, right-wingers viewed the left-wing-dominated universities with a mixture of irritation and contempt. They regarded the entire academic enterprise (not just humanities) as a useless and wasteful undertaking that produces nothing while consuming taxpayer funds. Perceiving no value but also no direct threat from academic institutions, right wingers made no serious effort to stop or reverse the ongoing left-wing transformation of the nation's universities.

The rude awakening of the Right came only after painful shocks delivered by leftists academic experts: despotic COVID-19 mandates, insane transgender policies, destructive Black Lives Matter (BLM) riots, and Diversity, Equity, and Inclusion (DEI) initiatives that deprived many right wingers of gainful employment and gave critical jobs to unqualified "diversity hires." Even the right-wing upper middle class, previously insulated from hurtful leftist policies, has experienced the meaning of the "left-wing-favoring power asymmetry."[22,23]

Owing to the Right's passivity and lack of knowledge, an unmistakable power asymmetry developed. Continued passivity emboldened power-hungry leftist tyrants. Finally, after being pushed to the edge, the Right responded in a highly emotional

fashion, lashing out against not just Marxist professors but against the entire concept of academia. Current campaigns of retribution include indiscriminate grants cancelations. Those cuts were ostensibly aimed at liquidation of wasteful Woke projects, yet they have hurt numerous truly valuable research programs.

The present chaotic demolition of academia is not associated with any plans to rebuild a better alternative to its leftist version. There are no attempts to persuade the academic community that everyone can benefit from cooperation between former enemies in the way Americans reached out to defeated Germany and Japan after the Second World War. Instead, even faculty members who are secretly sympathetic to right-wing causes are being alienated by the indiscriminate performative cruelty. Unjustly dispensed excessive penalties hurt more innocent rank-and-file scientists than guilty leftist activist leaders.

Supporters of the academic pogroms evidently believe that academia can be fully replaced by artificial intelligence (AI), private-sector scientists, or prominent internet-based dissidents. In fact, the nation cannot prosper and defend itself without reliable academic expertise and the vast resources available in academic institutions.[21] None of America's competitors have destroyed their academic institutions, but are strengthening them. To prevail, right-wing reformers should reach out to academia to find inside allies and work with them to free our universities from ideological capture by the extreme Left and reinstate the needed objectivity.

In the above context, this editorial is not meant to replace formal academic research. It is another wakeup call pointing out that indispensable academic expertise has been lost, and academia has to be restored not demolished. Only then can the serious concerns raised by this editorial be truly resolved for the benefit of patients and for the secure future of our country.

Perception of Musculoskeletal Side Effects: Typical Top-Down Opinion Discrepancy

As with the previously discussed cutaneous side effects of mRNA vaccine, its musculoskeletal effects have received considerably less attention from both regulatory authorities and mainstream academic researchers.[18] However, in contrast to cutaneous lesions that were (and are) also ignored by the public, laymen have been very vocal in their concerns about the frequency and severity of musculoskeletal pathologies arising after inoculations with mRNA vaccines.

Public expressions of concern appeared widely during and after the vaccine rollout (especially 2021–2023). They included the direct reports to their physicians, posts on social media (X/Twitter, Facebook groups), patient forums (e.g., Reddit threads on r/CovidVaccinated or vaccine injury communities), lay people's comment sections of medical journals, and VAERS (Vaccine Adverse Event Reporting System) submissions. For instance, patients reported new or worsened joint swelling/pain in multiple sites (knees, elbows, hands, spine) starting days to weeks after doses, sometimes lasting months and interfering with daily life. This was documented by Dawoud et al. in their review of 16 case reports.[24] There were anecdotal reports from the workers' doctor's offices noting spikes in complaints like arm/leg pains, rheumatic flares, or persistent myalgia after boosters.[25] Individuals were describing severe, ongoing issues on the Facebook page of the Arthritis Foundation: e.g., "terrible joint pains for approx. 4 months after Moderna" affecting multiple joints, or family members diagnosed with "rheumatoid arthritis post-vaccination."[26]

However, one need not rely only on social media to find evidence of those commonly reported worries. The scientific literature later captured many of these patient-reported experiences through case reports, systematic reviews, and observational studies.

Despite these public concerns, there is not a single officially reported pooled prevalence of musculoskeletal adverse reactions to mRNA vaccination from a meta-analysis or systematic review. To estimate those, one would have to derive them from multiple large-scale surveillance studies and clinical trials that contain consistent data on the incidence of these reactions.[27-30]

For instance, in the pivotal mRNA-1273 trial, moderate-to-severe musculoskeletal side effects (fatigue, myalgia, arthralgia, and headache) were noted in approximately 50% of participants after the second dose.[27] The large U.S. V-safe surveillance system, which monitored more than 7.9 million participants, found that systemic reactions (which include musculoskeletal symptoms) occurred in 52.7% after dose one and 70.8% after dose two.[28] These reactions were predominantly mild and transient, typically resolving within 2-3 days.

Strikingly, the specific musculoskeletal symptoms varied by study. In the homologous and heterologous booster study, severe arthralgia occurred in 0.6%–2.0% of participants, while severe myalgia occurred in 0–3.3% across different vaccine combinations.[29] An electronic health records study found increased reporting of arthralgia (risk difference = 0.42 percentage points) and myalgia (risk difference = 0.36 percentage points) after the third dose compared to the second dose.[31]

World pharmacovigilance data from EudraVigilance identified myalgia and arthralgia among the most prominent serious adverse event clusters, though these frequently co-occurred with other systemic symptoms like headache, fatigue, and pyrexia.[32] Yet, a large Nordic study of more than 13 million person-years found no increased risk of myositis following mRNA vaccination even in patients with musculoskeletal symptoms (adjusted IRR 0.84, 95% CI 0.63-1.11).[30] However, the authors of this study acknowledged that the significant limitations to their study is the fact that it was not possible for them to achieve fully accurate case ascertainment due to variable time from the start of symptoms to definite diagnosis. Some patients could develop myositis after the time that was captured by the study.

Such fragmentation and limitations of the research performed by academic experts to study the matter that greatly concerns the public is truly counterintuitive. One would expect that due to objectively documented massive societal concerns about musculoskeletal adverse effects of mRNA vaccines the academicians should go above and beyond their line of duty to provide satisfactory answers to legitimate questions that the public presented to them. However, the opposite has been done. Official studies were fragmented and limited, but in the public dispatches academic experts consistently claimed that vaccination-related myalgias and arthralgias while common were usually "mild and short-lived." They argued that those symptoms do not reflect

any unexpected serious pathology. Some orthopedic and rheumatology networks have published webpages specifically designed to address the avalanche of patients' worries in such a dismissive way.[33] Serious or persistent musculoskeletal events were described by experts "as extremely rare and accidental" and lacking any proof of casual relation to mRNA vaccines.[32] Certainly there will be no proof if one is not looking for it. It is true that laypeople often succumb to sensationalized viral falsehoods spread online by charlatans and cranks. However, the modern public is also capable of identifying deception perpetrated by official experts, who instead of providing persuasive evidence conceal their lies behind the authority of their once-credible institutions.

In summary, the discourse between the general public and academic experts regarding relevance of the musculoskeletal side effects of mRNA vaccine was characterized by profound top-down opinion discrepancy. Top experts dismissed sincere grassroot concerns arbitrarily and arrogantly. This pattern unfortunately mirrors broader vaccine safety debates that continue without resolution to date. No wonder that the public became disillusioned with previously credible academic institutions.

Relevance of the Musculoskeletal System

To fully grasp the importance of musculoskeletal disorders caused by mRNA vaccines, it is essential to have at least foundational understanding of how this system works—and what happens when it malfunctions. Sadly, not just a lay audience but even many medical professionals have a very low level of knowledge about the normal physiology and the pathology of the musculoskeletal disorders. Therefore, those basic aspects will be reviewed first.

The musculoskeletal system is fundamentally integral to human survival, acting as the indispensable mechanical foundation for locomotion, physical dexterity, structural support, and overall systemic homeostasis. Comprising an intricate and highly coordinated network of bones, skeletal muscles, cartilages, tendons, ligaments, and joints, the system provides the architectural framework necessary to support the body against gravitational forces, facilitates precise motor control, protects vital internal organs, and serves as the primary physiological reservoir for essential minerals such as calcium and phosphorus.[34]

For decades, the biomedical consensus viewed the musculoskeletal system primarily through a rigid biomechanical lens, emphasizing its role solely in physical mobility and structural integrity. However, contemporary molecular research has radically expanded this classical paradigm, revealing that skeletal muscle and bone, just like the skin, play a much more complex role than was believed.[35,36]

The musculoskeletal system is a highly active and dynamic homeostatic organ system that, like the skin, continuously communicates with the rest of the body to maintain systemic metabolic equilibrium via neuroendocrine mechanisms.[35,37] Muscles and bones secrete a vast array of biochemically active molecules termed **myokines** and **osteokines**, respectively, that exert autocrine, paracrine, and widespread endocrine effects far beyond the anatomical boundaries of the "mere locomotor apparatus."[35,37]

Skeletal muscle, when subjected to mechanical contraction during physical exertion, releases a myriad of myokines such as **interleukin-6 (IL-6), irisin, myostatin, leukemia inhibitory factor (LIF)**, and **decorin**.[38] These specialized proteins regulate local muscle hypertrophy, facilitate fuel oxidation, and control angiogenesis, while simultaneously functioning on a systemic level to suppress tumor growth, reduce systemic low-grade inflammation, improve cognitive function, and dramatically enhance insulin sensitivity.[35] For instance, myostatin acts as a critical negative regulator of myogenesis, preventing unregulated muscle hypertrophy, while decorin, secreted in direct response to exercise, directly antagonizes myostatin to promote healthy, adaptive muscle growth.[39] Furthermore, metabolic actions regulated by myokines are central to mitigating chronic diseases, positioning physical activity and muscle health as cornerstones of preventative medicine.[35]

Simultaneously, bone tissue actively participates in global metabolic crosstalk through the constant secretion of osteokines. **Osteocalcin**, the most abundant non-collagenous protein located in the bone extracellular matrix, undergoes a critical decarboxylation process in the acidic environment characteristic of bone resorption. This specific biochemical transformation enables its release into the systemic bloodstream as a potent, active hormone.[40] Once in circulation, decarboxylated osteocalcin acts directly on pancreatic islet beta-cells to promote insulin secretion, actively reduces visceral fat accumulation, and significantly influences both testosterone production and complex cognitive processing within the central nervous system.[40]

Furthermore, other bone-derived factors, such as **fibroblast growth factor 23 (FGF23)** and **sclerostin**, are instrumental in mediating mineral metabolism and regulating muscle catabolism.[38] This bidirectional biochemical crosstalk via myokines, osteokines, and adipose-derived **adipokines** underscores the profound reality that the musculoskeletal system is not merely a passive structural scaffold, but rather a central, active regulator of human systemic health.[38]

Consequently, any pathological disruption, inflammatory insult, or degenerative decay affecting this system inevitably precipitates a widespread cascade of metabolic, immunological, and psychological consequences, thereby emphasizing the immense relevance of maintaining musculoskeletal integrity throughout the entire human lifespan.

The Complexity of Musculoskeletal Disorders: a Cross-Disciplinary Challenge

Musculoskeletal disorders encompass a vast, heterogeneous array of more than 150 distinct pathological conditions that adversely affect the locomotor system and its associated connective tissues.[41] The clinical diagnosis, management, and long-term therapeutic strategy for these disorders are inherently and profoundly complex, transcending traditional, isolated medical boundaries.[42] Effective clinical care requires a highly integrated, cross-disciplinary approach that spans the specialized fields of rheumatology, orthopedics, sports medicine, endocrinology, neurology, physical therapy, and rehabilitative sciences.[42] This multidisciplinary necessity arises directly from the overlapping etiologies, shared molecular pathways, and systemic

manifestations of musculoskeletal pathologies.[43]

Rheumatology primarily addresses the complex spectrum of autoimmune and autoinflammatory conditions—such as rheumatoid arthritis, systemic lupus erythematosus (SLE), spondyloarthritis, and psoriatic arthritis—where aberrant immune system responses target synovial membranes, articular cartilage, and connective tissues as summarized in Figure 1.

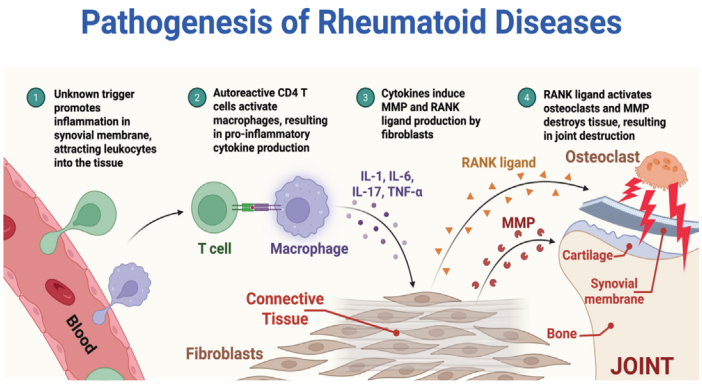

Figure 1. Pathogenesis of rheumatoid disorders. **MMP:** Matrix metalloproteinase; **RANK:** Receptor Activator of Nuclear Factor Kappa-B.

Patients exhibiting inflammatory joint destruction, severe morning stiffness, or potential connective tissue diseases require meticulous rheumatological evaluation to establish early diagnosis and initiate treatment with advanced disease-modifying antirheumatic drug (DMARD) therapy or biologic agents.[44] The management of these rheumatic diseases is further complicated by high psychosocial complexity, necessitating the use of specialized assessment tools like the INTERMED clinical interview and the Systemic Lupus Erythematosus Needs Questionnaire (SLENQ) to properly coordinate care.[45]

Orthopedics and sports medicine focus primarily on the biomechanical deterioration of major joints, acute traumatic injuries, overuse syndromes, and the surgical reconstruction of compromised musculoskeletal structures.[43] Conditions such as severe osteoarthritis, complex rotator cuff tears, spinal degenerative disc disease, and structural bone fractures necessitate precise, often invasive interventions ranging from minimally invasive arthroscopy and joint arthroplasty to the application of orthobiologics, patient-specific instrumentation, and enhanced postoperative recovery protocols.[43,44]

Endocrinology plays an absolutely pivotal role in musculoskeletal medicine, as hormonal imbalances deeply and directly dictate bone mineral density and skeletal muscle mass.[43,46] Endocrinologists must routinely manage osteoporosis, osteopenia, and the profound musculoskeletal consequences of metabolic diseases.[46] Diabetic patients, for example, frequently experience accelerated bone loss, advanced connective tissue alterations in the hands, and specific, severe myopathies such as diabetic muscle infarction.[47] Additionally, disorders involving thyroid dysfunction, hyperparathyroidism, acromegaly, or hypercortisolism directly precipitate distinct rheumatic manifestations and drive progressive structural skeletal decay.[46]

Neurological expertise is critical in the diagnostic phase, particularly for differentiating between purely structural musculoskeletal issues and neurological conditions that present with overlapping symptoms, such as nerve entrapment, spinal cord neoplasia, or radiculopathy.[48] Neurologists also evaluate and manage the phenomenon of central sensitization, a process where the central nervous system undergoes maladaptive reorganization and becomes hyper-reactive, sustaining chronic musculoskeletal pain even in the absence of ongoing localized tissue damage. Furthermore, they manage severe musculoskeletal deformities and functional limitations that arise secondary to primary neurological disorders, such as dystonia or Parkinson disease.[48]

Physical therapists focus directly on restoring mobility, strengthening weakened muscles, and managing pain through structured, hands-on treatment. They employ a combination of passive treatments (such as manual therapy, heat, and ice) and progressive active treatments, including sensorimotor training and graded exercise regimens tailored to the patient's specific injury or chronic condition. Crucially, physical therapists also provide pain neuroscience education, helping patients understand the biopsychosocial mechanisms of their pain to reduce fear-avoidance behaviors and improve motor control.[49,50]

Rehabilitative science provides the overarching, evidence-based framework that guides the entire recovery process. It utilizes a biopsychosocial model to coordinate a multidisciplinary team—which can include physiatrists, neurologists, physical therapists, and psychologists—aimed at returning patients to their highest possible level of functional independence and quality of life. Additionally, rehabilitation science drives innovation in treatment by exploring advanced strategies such as regenerative rehabilitation (encouraging musculoskeletal tissue repair alongside neural plasticity), virtual reality, robotics, and targeted exercise physiology to optimize highly individualized care.[50]

The intricate web of genetic predisposition, biomechanical wear-and-tear, neuro-immune interactions, and endocrine metabolic shifts ensures that accurately diagnosing and managing these interlinked musculoskeletal disorders remains one of the most formidable challenges in modern clinical medicine.[41]

The Progressive Nature and Diagnostic Challenges of Musculoskeletal Pathologies

A defining characteristic that vastly amplifies the complexity of many musculoskeletal conditions is their highly progressive, insidious nature, which renders immediate and definitive clinical diagnosis exceptionally difficult. Unlike acute infectious diseases or sudden cardiovascular events, pathologies such as osteoporosis, osteoarthritis, and chronic tendinopathies often develop silently over the course of decades.[44] These conditions systematically and slowly remodel tissue architecture, degrade hyaline cartilage, and deplete bone mineral reservoirs long before reaching a critical clinical threshold capable of producing recognizable pain or functional impairment.[44]

Because these disorders are typically characterized by a gradual onset of persistent, nonspecific pain and a slow, creeping decline in mobility, flexibility, and motor dexterity, determining the exact temporal onset or identifying a singular causative trigger presents a significant diagnostic hurdle. Patients frequently

normalize early symptoms as standard signs of aging, delaying presentation to clinical specialists until irreversible structural damage has already occurred.[43,44] In the context of inflammatory diseases like rheumatoid arthritis or axial spondyloarthritis, the early clinical presentation often mimics transient, benign joint pain.[44] Specialized serological testing (such as checking for rheumatoid factor or anti-citrullinated protein antibodies) and advanced imaging modalities (such as magnetic resonance imaging to detect early bone marrow edema) are required to differentiate these destructive autoimmune conditions from routine mechanical wear.[43]

Furthermore, severe and localized musculoskeletal complications can arise unpredictably, further obfuscating the diagnostic landscape. For example, complex regional pain syndrome type I (CRPS I), characterized by profound, disproportionate pain, severe functional limitation, and distinct vasomotor alterations, can occur as an underestimated consequence of minor orthopedic trauma, casting, or even non-orthopedic interventions.[43] Literature documents instances of CRPS I spontaneously following procedures as unrelated as percutaneous transluminal coronary angioplasty, demonstrating the highly reactive and unpredictable nature of the neuro-musculoskeletal network.[43] This inherent diagnostic uncertainty is a critical factor when assessing potential adverse events following medical interventions, as pre-existing, subclinical progressive diseases may coincidentally reach their symptomatic threshold concurrently with an exogenous event, such as a vaccination.

The Burden of Musculoskeletal Conditions: Quality of Life and Functional Independence

The global epidemiological burden of musculoskeletal conditions is staggering in its sheer scale, currently affecting an estimated 1.71 billion individuals worldwide.[41] Driven by rapid population aging, universally increased life expectancy, and rising global rates of sedentary behavior, musculoskeletal disorders have firmly established themselves as the leading contributor to human disability globally.[41] Within this vast category, low back pain ranks as the single leading cause of disability across 160 different countries.[41] These conditions represent a massive public health challenge, severely disrupting essential mobility, motor control, structural stability, and ultimately, functional independence.[41]

The primary clinical manifestations of musculoskeletal disorders—chronic, unremitting pain and severe functional limitation—exert a profound, well-documented, and highly quantified negative impact on health-related quality of life (HRQOL).[48] Longitudinal epidemiological data from large inception cohorts demonstrate unequivocally that the onset of a new musculoskeletal disorder causes a marked deleterious drop in physical functioning and overall systemic vitality.[48] For instance, quantitative analyses utilizing validated quality-of-life metrics reveal a statistically significant 25% reduction in HRQOL utility scores—dropping from an average healthy baseline of 0.862 down to 0.636—for individuals diagnosed with chronic musculoskeletal conditions compared to those without.[50] The attributes of "pain" and "discomfort" were identified as the major drivers of this drastic reduction in HRQOL.[50,51]

The greatest measurable change in quality of life is often reflected in the physical domains; research shows a precipitous 10-point drop in the 100-point SF-36 bodily pain dimension scale specifically attributable to new-onset musculoskeletal issues.[51] Compared with healthy controls, subjects afflicted with a musculoskeletal disorder experience significantly greater measurable reductions in multiple dimensions: bodily pain (a -7.4 point difference), vitality (-2.7), general health (-1.8), and physical functioning (-1.3).[48] Furthermore, chronic musculoskeletal disorders exert a substantially greater impact than acute injuries on emotional role functioning (-8.4) and social functioning (-5.9).[51]

Consequently, individuals suffering from these ailments report significant daily difficulties in executing routine activities of daily living (ADLs).[51] In the U.S. alone, data indicates that 36% of the adult population reports difficulties performing routine activities due to medical conditions, with 64 million of these individuals pointing to a concomitant musculoskeletal issue as the root cause.[52] This loss of functional independence leads directly to an increased reliance on health infrastructure, a much higher likelihood of early retirement, and prolonged, economically devastating work absences.[52] Because 58% of those affected are in their prime working years (ages 25–64), musculoskeletal disorders severely disrupt labor force participation.[52] The indirect economic costs—encompassing disability benefit payouts, extensive rehabilitation requirements, and lost economic productivity—are estimated to be as high as $624.8 billion annually in the U.S., highlighting the catastrophic societal impact of these conditions.[52]

Serious Secondary Morbidities: Cardiovascular Risk, Metabolic Decline, and Psychiatric Comorbidities

Beyond the immediate structural, biomechanical, and functional impairments, musculoskeletal disorders are intricately and dangerously linked to a broad spectrum of severe secondary morbidities.[52] The restriction of physical mobility inherently catalyzes a rapid cascade of physiological decline, primarily operating through the acceleration of metabolic syndrome and the deterioration of cardiovascular health.[52] Because musculoskeletal pain drastically attenuates physical activity levels—with approximately 76% of affected adults reporting direct, substantial limitations on their capacity to exercise—individuals are placed at a significantly elevated risk for chronic cardiovascular and metabolic diseases.[52]

Musculoskeletal conditions act as a "silent contributing factor" to systemic disease precisely because the resulting physical inactivity is a well-established, primary driver of metabolic disruption.[52] Clinical data consistently reveal that patients with musculoskeletal disorders exhibit much higher rates of comorbid conditions; for example, hypertension is present in 24% of certain musculoskeletal patient cohorts compared to only 14% in matched healthy controls.[50] This disease clustering means that individuals with musculoskeletal issues frequently suffer from concomitant circulatory conditions, including ischemic heart disease and stroke, as well as respiratory complications.[52]

The loss of the myokine-mediated protective effects (such as IL-6 and irisin regulating lipid metabolism and insulin sensitivity) due to muscle disuse directly fuels this metabolic decline.[38]

Ultimately, the presence of severe musculoskeletal disorders is statistically associated with a measurable increase in all-cause mortality.[52] Moreover, there is a profound, bidirectional, and highly destructive relationship between musculoskeletal chronicity and severe psychiatric decline, specifically major depressive disorder (MDD) and clinical anxiety.[52] Chronic pain, severe sleep disruption (reported by 72% of musculoskeletal patients), and the sudden loss of social, occupational, and physical independence drive intense psychological distress.[52] Surveys indicate that 50% of individuals with musculoskeletal conditions report a severe negative impact on their mental health, and 66% indicate adverse effects on family and personal relationships.[52]

In turn, clinical depression actively exacerbates physical impairment, creating a vicious, compounding cycle.[53] Depressed patients afflicted with comorbid physical diseases experience significantly higher hospitalization rates, report more frequent and intense somatic pain symptoms, demonstrate slower return-to-work timelines following cardiovascular events or orthopedic surgeries, and show drastically reduced adherence to essential physical rehabilitation protocols.[53] The underlying pathophysiology of this psychiatric-musculoskeletal comorbidity is highly complex, involving shared biological pathways.[53] These include the chronic dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, widespread systemic inflammation mediated by circulating cytokines, mitochondrial energy metabolism deficits, and alterations in the gut microbiome.[54] This extensive disease clustering underscores the reality that musculoskeletal conditions are not isolated structural failures, but rather systemic, progressive catalysts that aggressively erode longevity and quality of life.[52]

Historical Context: Musculoskeletal Side Effects of Traditional Vaccines

To accurately contextualize the contemporary concerns surrounding novel mRNA vaccines, it is critical to rigorously examine the established historical precedent of musculoskeletal adverse events associated with traditional vaccination platforms. Musculoskeletal events have been reported in temporal association with virtually every vaccine in widespread use, including influenza, hepatitis B, tetanus toxoid–containing vaccines, the human papillomavirus vaccines, the herpes zoster vaccines (both live-attenuated and recombinant), pneumococcal vaccines, the measles–mumps–rubella vaccine, the Bacillus Calmette–Guérin (BCG) vaccine, and—more recently—both mRNA and viral-vector COVID-19 vaccines.[55,56] The range of conditions reported is broad and overlaps considerably across vaccine platforms; the principal entities are summarized below. Interestingly, the official explanation in all those cases is that these symptoms serve as explicit clinical indicators of the acute activation of the innate immune system, a necessary biological step for generating long-lasting adaptive immunity.[57] However, as summarized in Table 1, certain traditional vaccines, most notably the recombinant hepatitis B (HBV) vaccine, the human papillomavirus (HPV) vaccine, and influenza (Trivalent) vaccine have been definitively associated with more severe (albeit purportedly statistically rare) musculoskeletal and rheumatic complications.[58]

Extensive disproportionality analyses of post-marketing surveillance databases, such as the Vaccine Adverse Event Reporting System (VAERS) spanning decades, have identified strong pharmacovigilance signals linking these traditional platforms to specific, highly debilitating musculoskeletal pathologies.

Table 1. Selected Serious Adverse Effects and Their Proposed Mechanism of Action of HBV, HPV and Trivalent Influenza Vaccines.[58]

Traditional Vaccine Type	Documented Musculoskeletal & Neuromuscular Adverse Events	Proposed Mechanism & Associated Risk Factors
Hepatitis B (HBV)	Tendon fibrosis, macrophagic myofasciitis (MMF), fasciitis, nuchal rigidity, severe arthralgia, polyarthritis	Persistent aluminum adjuvant deposition causing localized granulomas and chronic Th2-mediated inflammation; slow-release toxicity
Human Papillomavirus (HPV)	Grade 3 arthralgia, Isaacs syndrome (peripheral nerve hyperexcitability, continuous muscle twitching, severe muscle stiffness)	Immune-mediated responses, aluminum adjuvant slow-release properties, specific autoantibody generation (LGI1, CASPR2)
Influenza (Trivalent)	Arthralgia, myalgia, rarely inflammatory arthritis flares	Transient immunological cross-reactivity, mild systemic inflammation

The pathogenesis of the more severe chronic musculoskeletal reactions following traditional vaccinations is heavily attributed to the presence of **aluminum-based adjuvants**.[58] Aluminum adjuvants are utilized in approximately one-third of all licensed traditional vaccines to artificially enhance immunogenicity.[58] However, these metallic compounds possess distinct slow-release pharmacokinetics.[58] In a subset of individuals—particularly those with impaired renal clearance function—these metallic compounds fail to disseminate and be excreted normally.[58] Instead, they accumulate locally at the injection site or systemically within the skeletal and nervous systems.[58]

This persistent aluminum accumulation triggers a chronic localized inflammatory cascade orchestrated by macrophages, directly leading to severe conditions such as macrophagic myofasciitis (MMF)—a specific chronic muscle disorder characterized by profound, unrelenting myalgia and severe chronic fatigue.[58] Epidemiological data from VAERS demonstrate that MMF can present with an exceptionally long latency period, averaging 1,671 days post-vaccination, which perfectly reflects the insidious, persistent nature of aluminum deposition.[58] Similarly, tendon fibrosis, resulting from excessive extracellular matrix deposition and abnormal tissue repair driven by chronic inflammation, has shown an extreme statistical association with the HBV vaccine, presenting a reporting odds ratio (ROR) of 251.82.[58] Fasciitis (ROR 71.52) and nuchal rigidity (ROR 16.19) are also strongly correlated with HBV administration.[58]

Additionally, systemic autoimmune responses, including cases of severe reactive arthritis, systemic lupus erythematosus (SLE), and Isaacs syndrome, have been documented following HBV and HPV immunizations.[59] To be fair, the evidence for vaccine-triggered Isaacs syndrome with LGI1 and CASPR2 autoantibodies (characterized by continuous muscle fiber activity, peripheral nerve hyperexcitability, and profound muscle stiffness) is quite limited, consisting of only a single published case report following HPV vaccination.[60] Yet again, the academic experts showed no due diligence in investigating this phenomenon further.

A comprehensive review of HBV vaccine adverse events

by Zafir et al. highlighted that 59% of patients in a specific symptomatic cohort demonstrated musculoskeletal signs, including arthralgia (36.5%), myalgia (25.8%), joint stiffness (19.3%), and arthritis (10.7%). However, this study has significant methodological limitations, including a highly selected population (all patients sought legal consultation, introducing substantial selection bias), retrospective case series design (without control group), focus on temporal association only (that establishes correlation but not causation), small sample size, and lack of standardized diagnostic criteria. Those limitations do affect interpretation of the authors' findings. However, no improved follow-up study of this subject has been undertaken.

All these extensive historical precedents, even if poorly investigated, firmly established the biological plausibility that exogenous immune stimulation via vaccination could, in susceptible individuals, trigger highly aberrant, destructive musculoskeletal conditions.

The Putative Concerns Regarding mRNA COVID-19 Vaccines and Musculoskeletal Health

The concerningly rushed development, authorization, and unprecedented global deployment of the novel mRNA COVID-19 vaccines with the enforcement by "mandates" (primarily the Pfizer-BioNTech BNT162b2 and Moderna mRNA-1273 vaccines) represented an unprecedented event in the history of medicine.[61]

Unlike traditional vaccines that introduce attenuated viruses, inactivated pathogens, or recombinant proteins alongside traditional aluminum adjuvants, mRNA vaccines utilize an entirely novel mechanism.[61] They employ synthetic lipid nanoparticles (LNPs) to deliver laboratory-engineered messenger RNA directly into the cytoplasm of the host's dendritic cells and myocytes at the injection site.[61] Upon cellular entry, the host's own ribosomes translate the mRNA code to synthesize the full-length SARS-CoV-2 spike (S) glycoprotein.[61]

This synthesized protein is subsequently expressed on the cell surface, simulating a viral infection to stimulate a robust adaptive immune response without exposing the patient to the actual virus.[62]

Despite the optimistic narrative about the purported "safety and efficacy" of those new vaccines promulgated by the authorities, their novel mechanism of action, combined with the unprecedented scale of the global vaccination campaign, inevitably generated widespread public and clinical apprehension regarding potential adverse effects.[61]

The top-down discrepancy can be easily observed here. Much of this intense concern expressed by the public and a few clinicians centered on the musculoskeletal system. Because natural, wild-type SARS-CoV-2 infection is deeply associated with severe myalgia, extreme physical fatigue, and highly debilitating post-acute sequelae (often referred to as long COVID)—which is characterized by chronic musculoskeletal pain, dysautonomia, and chronic fatigue syndrome (CFS/ME)—intense fears arose in the general public and among a few clinicians that a vaccine explicitly designed to induce the expression of the viral spike protein might inadvertently replicate these exact severe morbidities.[63] However, regulators and leadership of academic research remained largely unconcerned about such a possibility.[32,33]

Furthermore, the initial phase 3 clinical trials, which were accessible to the public and private clinicians, and the flood of early real-world data immediately confirmed that mRNA vaccines possessed extraordinarily high reactogenicity.[64] And the most frequently reported immediate adverse events were predominantly musculoskeletal in nature, including severe localized injection site pain, profound systemic myalgia, extreme fatigue, chills, and arthralgia.[65] Given the progressive, debilitating, and difficult-to-treat nature of autoimmune musculoskeletal disorders, a critical and highly valid question emerged within a small but vocal segment of the global rheumatological, orthopedic, neuroendocrine, and physical therapy communities: Could the intense, mRNA-driven immunological stimulation inadvertently break established immune tolerance, thereby triggering de novo chronic inflammatory musculoskeletal diseases or causing severe, destructive flares in patients with pre-existing rheumatological conditions?[61] Remarkably, those logical concerns were not shared either by the leaders of regulatory agencies, or by the majority of academic researchers.

Theoretical Mechanisms: How mRNA Vaccines Could Induce Musculoskeletal Pathologies

The scientific proposition that mRNA vaccines could induce a variety of musculoskeletal side effects is robustly supported by several highly complex, overlapping theoretical mechanisms deeply rooted in molecular immunology, cytokine biology, and immunogenetics.

At the most fundamental biological level, the expected, transient musculoskeletal symptoms—such as deltoid pain, systemic myalgia, and arthralgia—are direct, unavoidable physiological manifestations of the innate immune system's activation.[61] This innate activation is a non-negotiable prerequisite for developing the desired adaptive immunity; without it, the vaccine would be entirely ineffective. The lipid nanoparticles (LNPs) used as the critical delivery vehicles inherently possess strong pro-inflammatory properties, instantly establishing a localized inflammatory microenvironment upon intramuscular injection into the deltoid.[61] Concurrently, the newly translated SARS-CoV-2 spike glycoprotein (specifically the CoV-2-S1 subunit) acts as a highly potent endogenous alarmin.[61]

This spike protein physically interacts with Toll-like receptor 4 (TLR4) on the surface of host dendritic cells and local muscle fibers, rapidly triggering the TLR4/MyD88/NF-κB B intracellular signaling cascade. The subsequent activation and nuclear translocation of nuclear factor kappa B (NF-B) results in the massive transcription and widespread systemic secretion of highly active pro-inflammatory cytokines, specifically interleukin-1 (IL-1), interleukin-1beta (IL-1beta), interleukin-6 (IL-6), and tumor necrosis factor alpha (TN-α).[61]

This acute, systemic "cytokine surge" rapidly permeates the musculoskeletal vascular bed.[61] These cytokines directly sensitize nociceptors located within the muscle fascia, joint synovium, and connective tissues, producing the widespread physiological aches, joint stiffness, and fatigue that characterize the base level

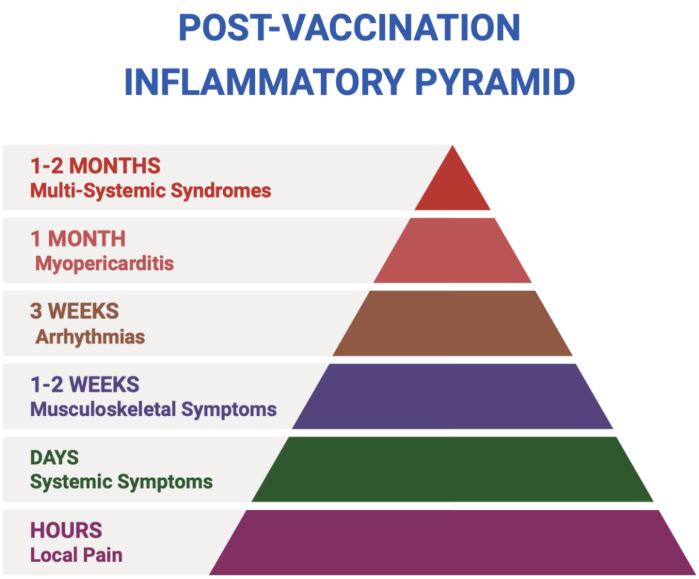

Figure 2. Inflammatory pyramid (IP) following COVID-19 mRNA vaccine

of the post-vaccination "inflammatory pyramid" (see Figure 2).[61]

Research demonstrates a direct, significant linear correlation ($p < 0.05$) between elevated serum levels of TNF-α and the severity of these systemic musculoskeletal symptoms one day following the second mRNA dose.[62] Beyond this acute reactogenicity, the pathogenesis of sustained inflammatory rheumatological conditions and severe autoimmune exacerbations post-vaccination is postulated to rely on the mechanisms of molecular mimicry and bystander activation.[66]

Molecular mimicry occurs when specific structural homologies—often referred to as peptide sharing—exist between the introduced vaccine-derived antigen (the SARS-CoV-2 spike glycoprotein) and native human host tissue proteins.[66] Due to this extensive cross-reactivity, a hyper-stimulated, confused immune system may mistakenly direct its highly destructive T-cell and B-cell responses against the body's own articular cartilage, synovial tissues, or striated muscle fibers, initiating a classic autoimmune attack.[66] Furthermore, emerging pathological evidence suggests that both the SARS-CoV-2 virus and the vaccine-generated spike protein may persist in specific tissues or the systemic circulation for an extended duration, potentially sustaining low-grade, chronic inflammatory responses that continuously fuel musculoskeletal irritation.[67]

Bystander activation represents another critical, potent pathogenic pathway. The intense local cytokine milieu—driven by the release of Type I interferons (IFN-1), IL-15, and IL-18 induced by the mRNA and LNPs—can indiscriminately activate pre-existing dormant, autoreactive CD8+ T cells in a manner entirely independent of specific antigen receptor stimulation.[66] Once activated by this overwhelming cytokine storm, these autoreactive T cells secrete massive amounts of interferon-gamma (IFN-γ) and release destructive proteolytic enzymes that degrade local musculoskeletal tissues, causing significant joint and muscle damage.[66]

Finally, the **stimulation of Toll-like receptors** (specifically TLR-7 and TLR-9) by the novel vaccine adjuvants and mRNA components has been shown to rapidly activate age-associated B cells (ABCs)—specifically identified as double negative or CD11c+ T-bet+ cells.[66] These ABCs are highly prevalent in early-stage autoimmune cascades.[66] Under the influence of surrounding interleukins (like INF-γ or IL-21), these ABCs rapidly differentiate into autoantibody-secreting plasmablasts, directly driving localized joint inflammation and the onset of systemic rheumatic diseases.[66] Crucially, the precise magnitude, severity, and duration of these mechanisms are highly variable between patients, strictly dictated by an individual's distinct genetic background, human leukocyte antigen (HLA) haplotype, and previous epigenetic modifications, which explains variability of rheumatological reactions despite the universal biological mechanisms occurring in all vaccine recipients.[57]

Reported Musculoskeletal Adverse Events Following mRNA COVID-19 Vaccination

As global pharmacovigilance databases rapidly accumulated unprecedented amounts of real-world clinical data, a highly detailed and clear clinical picture emerged regarding the true spectrum of musculoskeletal adverse events temporally associated with mRNA COVID-19 vaccines. These recorded events can be accurately stratified into common transient reactogenicity, inflammatory rheumatic manifestations, complex neuropathic overlaps, and mechanical administration injuries.

Common Transient Reactogenicity

The most ubiquitous musculoskeletal side effects are entirely self-limiting, localized, and systemic reactions occurring almost exclusively within the first 48 hours post-vaccination.[68] Meta-analyses of massive clinical cohorts—including a dataset reviewing more than 884,000 Pfizer recipients and the phase 3 randomized controlled trials of Moderna involving more than 14,000 participants—confirm unequivocally that localized injection site pain and systemic myalgia are the predominant adverse events.[69] The incidence, frequency, and severity of these symptoms are heavily dose-dependent, scaling significantly upward after the administration of the second mRNA dose.[62] This perfectly mirrors the established biological mechanism, as the secondary surge of IL-6 and TNF-α is far more intense than the primary response.[62]

Other common systemic musculoskeletal reactions reported include varying degrees of joint pain (arthralgia), chills, generalized body aches, and transient muscle weakness.[69] Demographically, these outcomes are measurably more prevalent in younger adults (aged 18–55) and women compared to older demographics, pointing to a more robust, reactive immune system in these cohorts.[64] These symptoms are acutely uncomfortable and typically prompt patients to seek care and receive a variety of standard arthralgia treatments including administration of nonsteroidal anti-inflammatory agents (NSAIDs) or Plaquenil™ (hydroxychloroquine). The latter is not first-line therapy but tends to be used in resistant cases.[68,70] The official claim is that these vigorous and unpleasant symptoms signify "a highly functional, healthy immune response," and they after all are controlled by

standard therapies for arthritis including NSAIDs, steroids, and hydroxychloroquine.[68,70] It is intriguing that to date no studies were done searching for the increased number of prescriptions for the "standard therapies for arthritis" including use of hydroxychloroquine—which has a peculiar history of its own.[10,12]

Inflammatory Rheumatic Manifestations

More clinically concerning, yet statistically rare, is the documented de novo onset or severe exacerbation of inflammatory joint diseases following immunization.[68] Following the global rollout, international rheumatological networks meticulously documented distinct patterns of inflammatory musculoskeletal presentations.

As summarized in Table 2, in a notable, highly detailed collaborative study comprising 66 specific confirmed cases of post-vaccine musculoskeletal inflammation compiled by 16 different Italian rheumatology centers, the clinical phenotypes were heavily and consistently clustered.[32]

Table 2. Clinical Presentation, Frequency, and Clinical Features of Musculoskeletal Side Effects of COVID-19 Vaccine[32]

Clinical Presentation	Frequency among Reported Inflammatory Cases	Characteristics & Clinical Features
Polymyalgia Rheumatica (PMR)-like Syndrome	41%	Severe bilateral girdle pain and stiffness, elevated acute-phase reactants; highly symmetric presentation (89%); excellent clinical prognosis
Oligoarthritis	32%	Asymmetrical swelling typically affecting large joints, frequently accompanied by enthesitis (inflammation at tendon insertion sites, 14%)
Polyarthritis	27%	Symmetric involvement (83%) primarily affecting small joints; frequently accompanied by severe tenosynovitis (39%); a more persistent clinical course

These inflammatory conditions typically manifested an average of 11 to 13 days after the triggering mRNA dose, with nearly half of the cases (44.4%) surprisingly coinciding with the initial dose rather than the second.[71] Interestingly, specific adaptive autoimmune serology (such as the detection of novel autoantibodies) and HLA-B27 positivity were largely absent in these patients.[71] This critical finding suggests that the pathogenesis was driven predominantly by the robust, uncontrolled activation of the innate immune system (via the aforementioned cytokine surge) rather than the permanent establishment of a classic, adaptive autoimmune disease.[71] According to official claims, the clinical prognosis for these alarming events was overwhelmingly positive, if treatment as described above was provided. The PMR-like presentations were highly responsive to first-line systemic glucocorticoids, with 74% of patients achieving full, lasting clinical remission within two weeks of targeted treatment.[71] Polyarthritic presentations proved slightly more stubborn, with 67% of patients still demonstrating active disease after six weeks, occasionally necessitating the careful initiation of standard DMARD therapies.[68]

Small Fiber Neuropathy (SFN)

An emerging, highly complex adverse event spanning both neurology and musculoskeletal medicine is the development of small fiber neuropathy (SFN) following mRNA vaccination.[72] Characterized pathophysiologically by the selective, immune-mediated damage to unmyelinated C-fibers and thinly myelinated Aδ-fibers (A-delta) fibers, SFN manifests clinically with intense, burning musculoskeletal pain, profound dysesthesias, altered temperature sensation, severe paresthesia, and widespread dysautonomia.[72] Case studies indicate that these symptoms typically emerge within days to a few weeks post-vaccination, often presenting in an unusual, non-length-dependent manner (meaning it affects the face, trunk, and proximal limbs simultaneously, rather than starting in the distal toes).[38]

Clinical diagnosis of SFN is definitively confirmed via highly specialized skin biopsies revealing a severe abnormal reduction in intraepidermal nerve fiber density.[73] Immunologically, these post-vaccine SFN cases frequently demonstrate the presence of specific rare autoantibodies, such as FGFR3 and TS-HDS, alongside positive antinuclear antibodies (ANA) and elevated immunoglobulin A levels.[72] These laboratory findings point strongly to a targeted immune-mediated destruction of peripheral nociceptive fibers triggered by the vaccine.[72] Notably, aggressive immunomodulatory therapies, such as the administration of intravenous immunoglobulin (IVIG), have demonstrated marked, documented efficacy in successfully reversing fiber density loss and completely alleviating the severe musculoskeletal pain associated with vaccine-induced SFN.[72]

Mechanical Complications: Shoulder Injury Related to Vaccine Administration (SIRVA)

It is crucial to note that not all severe post-vaccination musculoskeletal adverse events are immune-mediated; some are purely mechanical, structural, and inherently iatrogenic. Shoulder injury related to vaccine administration (SIRVA) represents a severe spectrum of inflammatory musculoskeletal pathologies—predominantly acute subacromial or subdeltoid bursitis, and severe rotator cuff tendinopathy—caused exclusively by the improper, overly deep, or anatomically misaligned insertion of the needle during the intramuscular injection process.[74,75]

When the vaccine payload is erroneously deposited directly into the delicate bursa sac, or adjacent to a rotator cuff tendon, rather than safely into the thick bulk of the deltoid muscle, the highly immunogenic lipid nanoparticles and mRNA trigger an intense, highly localized inflammatory response confined to these tight anatomical spaces.[76,77] Patients afflicted with SIRVA present with agonizing shoulder pain, localized swelling, and a drastically restricted range of motion occurring precisely within 48 hours of injection.[76,77]

Unlike transient myalgia, these symptoms completely fail to resolve over standard timelines.[76] Advanced clinical imaging via MRI or ultrasound is highly diagnostic, consistently revealing significant shoulder edema, focal inflammation, fluid suppuration, and in rare cases, even intramuscular hematomas, without any evidence of generalized, systemic joint destruction.[74]

Treatment relies heavily on intra-articular corticosteroid injections, aggressive NSAID regimens, and targeted physical therapy.[42] In rare, refractory cases, arthroscopic surgical intervention is required.[76] Importantly, SIRVA is thought to be more prevalent in women because they generally have less deltoid muscle mass, making them far more vulnerable to injuries from unnecessarily long needles.[77] Theoretically, this condition should be preventable through rigorous clinical adherence to proper injection landmarking, ensuring optimal distance from the acromion process, and utilizing strict, appropriate needle length selection.[77] Unfortunately, best theory does not assure best practices.

Lack of Large-Scale Epidemiological Evidence

To accurately and objectively determine the true threat level of mRNA vaccine-induced musculoskeletal conditions, it is absolutely imperative to evaluate large-scale epidemiological meta-analyses and massive cohort data rather than relying solely on isolated, anecdotal case reports.

Surprisingly, very few such studies were done to date, despite the fact that extensive real-world data and information from peer-reviewed continuous surveillance from global regulatory bodies are available. The few, underpowered studies that have been performed claim that their results confirm that more than 95% of all reported adverse events following mRNA vaccination are entirely mild to moderate in severity, inherently self-limiting, and require absolutely no medical intervention, advanced therapy, or hospitalization.[64] Only a marginal 5% of participants required any form of medical evaluation.[64] However, such a statement is inconsistent with observable reality and tacit clinical data.

Moreover, even among those few studies some rigorous, highly scrutinized datasets have indeed noted an absolute increase in the risk of serious adverse events (SAEs) in mRNA recipients compared to strict placebo cohorts (with one study identifying a calculated 16% higher relative risk of SAEs). Yet, the relevance of musculoskeletal side effects is still being minimized.[78]

When assessing musculoskeletal health explicitly, a few available precise epidemiological studies demonstrated that vaccinated individuals experience a mathematically higher likelihood of being diagnosed with inflammatory musculoskeletal symptoms compared to unvaccinated baselines.[79]

As noted above, the role of the treatment with rheumatological medications like hydroxychloroquine (Plaquenil) in the long-term outcome of vaccinated patients has not been studied. This autoimmunity modulator became highly controversial in the partisan dispute over COVID disease treatment.[10,12] The possible impact of hydroxychloroquine not only on COVID disease but on the long-term effects of COVID-19 vaccination should be the subject of immediate and thorough investigation. Nothing of the sort is happening on a large scale.

It is critical to recall the historical data regarding traditional vaccines. Those traditional vaccines formulated with slow-releasing aluminum adjuvants have been as discussed unequivocally and statistically linked to highly prolonged, structurally destructive pathologies like macrophagic myofasciitis (with disease onsets stretching into several years). The novel mRNA platform does not contain metallic adjuvants. However, it does contain lipoproteins and produces highly immunogenic spike protein. Both of those could have autoimmune properties surpassing those of metallic adjuvants.

We simply do not know whether mRNA vaccine might contain numerous drivers in addition to Spike protein and lipoproteins capable of inducing long-term tissue granulomas, delayed-onset matrix fibrosis, and continuous, chronic inflammatory toxicity.[80,81]

Consequently, the nature and long-term significance of the vast majority of clinically observed rheumatic flares or de novo inflammatory arthritides occurring post-mRNA vaccination will remain a mystery—until those issues are seriously investigated. So far they have not been.

What if the mRNA platform is capable of causing immune hyper-activations leading to the chronic tissue-destructive autoimmune musculoskeletal diseases? What if these mRNA vaccines can provoke the chronic, progressive degradation of bone mineral density, joint architecture, or muscular integrity that defines the most severe natural musculoskeletal disorders? What if the common rheumatologic drug Plaquenil can not only alleviate the musculoskeletal side effects of mRNA vaccines but also have a long-term protective effect shielding patients from other side effects of this novel vaccine? Those are all important questions that no one in mainstream and even alternative medicine is asking.

Conclusions

The musculoskeletal system is an immensely complex, highly dynamic biomechanical and endocrine network, fundamentally vital to maintaining physical mobility, systemic metabolic stability, and overall psychological well-being. Disorders affecting this intricate system impart a truly devastating toll on patient quality of life and actively catalyze severe, life-shortening secondary morbidities, including widespread cardiovascular disease, severe metabolic decline, and debilitating psychiatric depression.

Consequently, as the novel, unprecedented mRNA COVID-19 vaccines were distributed globally, generating intense and biologically expected reactogenic side effects such as profound myalgia and arthralgia, public and clinical concerns regarding the potential for these novel genetic vaccines to inadvertently induce or severely exacerbate chronic, debilitating musculoskeletal conditions are scientifically plausible and need thorough investigation.

By now we should have a plethora of exhaustive, rigorous scientific reviews of the theoretical pathogenic mechanisms, detailed clinical case profiles, and analyses of the available massive, large-scale epidemiological data. But we do not. Top-down opinion discrepancy persists.

An epidemic of chronic disabling musculoskeletal pathology can become a public health crisis. We urgently need to know whether mRNA vaccines can cause this—and whether the problem is highly responsive to standard rheumatology treatment including use of Plaquenil (hydroxychloroquine) that predates COVID-19 vaccines by decades.

We need positive not negative evidence to deal with this issue. The demolition of "Woke" academia will not help here. We need unequivocal objective evidence that can be delivered only

by properly restored academic Institutions capable of complex research and willing to perform it, unhampered by ideological bias and conflicts of interest.

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